Beam Combination for Sparse Aperture Telescopes, Phase II

Completed Technology Project (2007 - 2009)

Project Introduction

This proposal is for funding to continue development of an alternative beam combiner for Stellar Imager (SI), a 30-aperture, interferometric telescope chosen as one of fifteen Vision Missions. Called the Spatial Frequency Remapper, SFR, it trades the large field of view of a Fizeau design for simultaneous observations at multiple wavelengths. Since SI does not require a large field, SFR, is a clearly better design. It can produce better images and allows tight control requirements to be relaxed. The SFR is also the heart of a full-aperture interferometric imaging system that will dramatically improve the performance of AO equipped telescopes. The Phase I study was remarkably successful. The SFR design was rejected during the Vision Study because of its perceived optical complexity. That concern was retired; the design is robust, even with many apertures. It needs only three optical surfaces, down from the five-surface design of the Vision Study. Tolerances are not tight. The inputs can be divided between combiners, further simplifying the optics and data flow with negligible effect on mission performance. The search for better sparse-aperture configurations worked. The search was sped up 1000 fold, enabling the discovery of the 30-aperture configurations needed for SI. The main commercial application, improving images from AO equipped telescopes, requires a seemingly impossible to build optical fiber interface. We found an alternative assembly procedure that is standing up well to detailed study. A data reduction technique was developed that should improve sensitivity by a factor of 1000, increasing the range of possible applications. The configuration search found ways to divide a full-aperture into the multiple configurations, tying off another loose thread in the design. Finally, a testbed and prototyping plan was developed since in our view the success of the Phase I study clearly supports continuing the development of this technology.

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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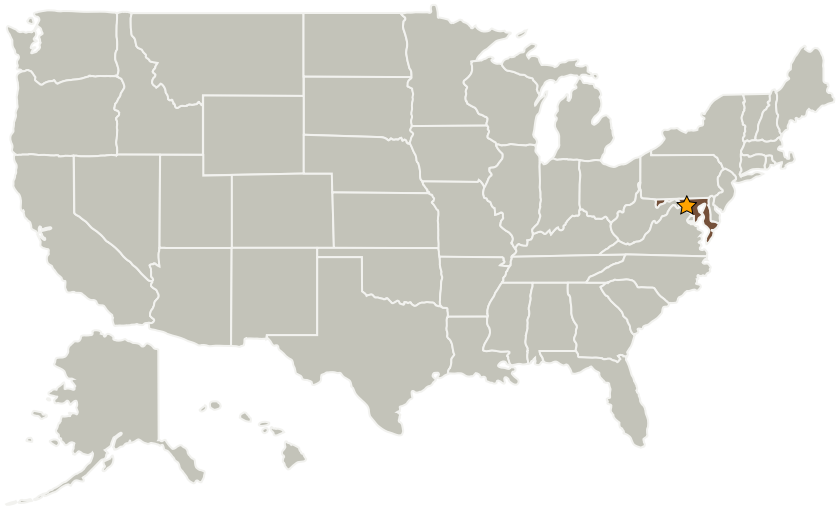
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Seabrook Engineering	Supporting Organization	Industry	Seabrook, Maryland

Primary U.S. Work Locations
Maryland

Project Transitions

December 2007: Project Start

December 2009: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes